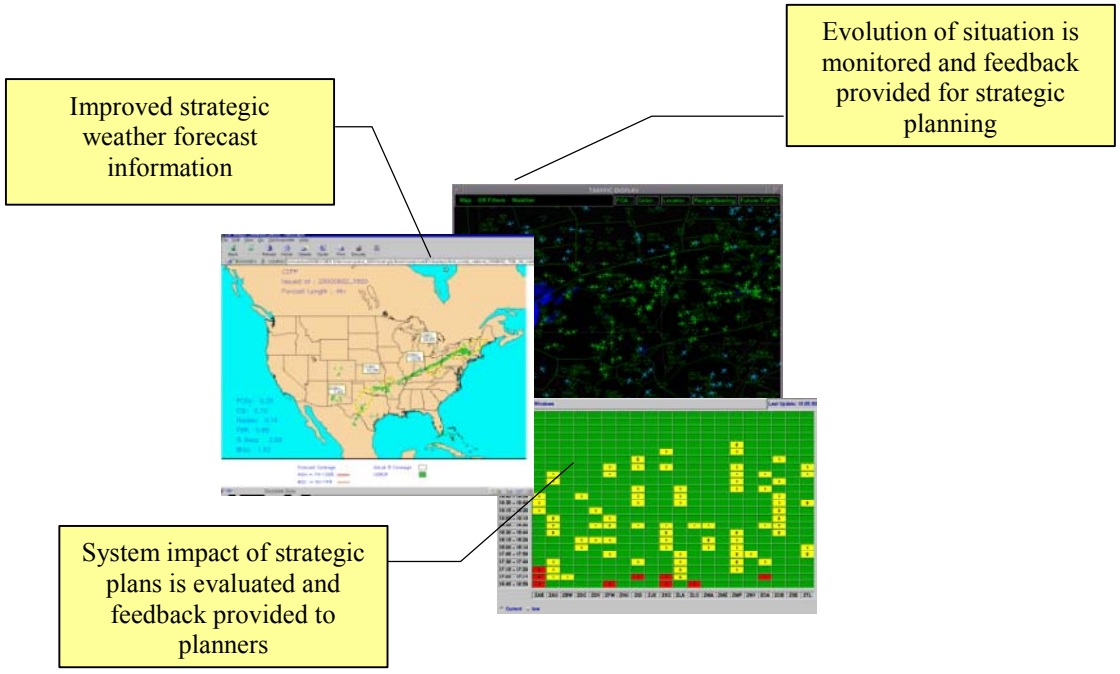
EW-1: Provide Better Hazardous Weather Data

Improved predictability in convective weather forecast products with respect to growth, decay, movement, intensity, and coverage of thunderstorm activity, which will lead to a more efficient operational response to the weather condition.



Background

Problems generated by en route hazardous weather involve uncertainties due to changes in National Airspace System (NAS) capacity and the often-unpredictable nature of convective weather. The convective weather forecast prediction accuracy is not well suited to the strategic planning time frame of traffic flow decisions. In addition, lack of forecast fidelity with respect to timing makes impacted flight identification difficult at best, leading to the belief by many that areas forecast to have convective activity, regardless of probability, need to be treated as "no fly zones" for the planning process. Additional difficulties arise from limited real-time, data sharing capabilities.

Ops Change Description

Improvements will be evolutionary and will span the near, mid, and long term timeframes. The key operational change is improving NAS predictability as a by-product of a high confidence level in the accuracy of convective weather forecasts. Operational change will be highly dependent on the state-of-the art science and research of forecasting convective weather growth, decay, movement, intensity, and coverage. Therefore, operational change with respect to common situational awareness, common data exchange, and operational significance of current forecast products (e.g., an understanding that the Collaborative Convective Forecast Product (CCFP) is for guidance and not for required compliance) should be improved through a focus on training and the

strategic planning process (identified in smart sheet ER-2) while work continues on improving convective weather forecasting. The following sections address the operational changes described:

- EW-1.1: Improved weather reporting and forecasting.
- EW-1.2: Dissemination of common weather information.
- EW-1.3: More precise identification of flights to be impacted by severe weather.
- EW-1.4: Display detailed weather to controllers.

Benefit, Performance and Metrics

As a result of the Summer 2001 operational experience using the CCFP, a number of evaluation studies have been launched. Since the data-gathering period was concluded (10/31/01), only a few preliminary impressions are available. Several reports (FSL; AvMet; and Metron) will be available by 2/02. Anticipating these evaluations, a list of improvements for CCFP in 2002 has been compiled and is under evaluation.

Other observations and tools have been implemented: Runway Visual Range (RVR), the Flow Constrained Area (FCA) tool, and the Collaborative Routing Coordination Tool (CRCT). Evaluation of these tools for their impact on Traffic Flow Management (TFM) is underway.

- Reduction in variance of execution against plan.
- Reduction in number and/or duration of ground delay programs in support of SWAP for en-route hazardous weather constraints.
- Reduction in the number and/or duration of ground stops due to hazardous en-route weather constraints. Reduction in fuel diversions due to hazardous weather encountered.
- Increased equity plus better plans equals an increase in system access/equity. This equity is achieved from narrowing the confidence gap that exists today from one system user to another or one FAA facility to another. Measurement of system access and area throughput along with analyzing user acceptance of the plan will determine forecast confidence.

EW-1.1 Improved Weather Reporting and Forecasting

Scope and Applicability

Improvements in the collaboration, issuance times, and operational applications of weather forecasts were implemented and studied as part of the 2001 convective weather season. Updates based on these findings and other weather research will lead to field trials in the coming years.

Currently, improvements in weather products are categorized into 3 components corresponding to Aviation Weather Research Program (AWRP) product development; Collaborative Decision Making (CDM)-CCFP development; and the TDWR products of Integrated Terminal Weather System (ITWS) and Corridor Integrated Weather System (CIWS). The cornerstone(s) for evaluating the experience during the Summer 2001

season lies correspondingly with the Aviation Weather Technology Transfer (AWTT) Board; the CDM Collaborative Routing (CR) Committee; and Lincoln Laboratory. Each of these organizations is reviewing the experience of the past convective season and will use these results for Summer 2002.

Near-Term:

- The CCFP is a collaborative product, developed by the Aviation Weather Center (AWC), Center Weather Service Units (CWSU), and Airline meteorological departments. A list of improvements to CCFP has been compiled and reviewed by an ad hoc committee under ARS-100. Subsequent review by the CDM-Collaborative Routing Committee will occur (12/01) for consideration of upgrades that are possible for Summer 2002.
- Corridor Integrated Weather System, CIWS will be evaluated during operations in the 2002 weather season. This product will focus on short-term weather on the timescales less than 1 hour within the corridor of heaviest air traffic between the Atlantic coast and Chicago. The CIWS employs TCWF technology to integrate weather and radar observations and produce forecasts of convective weather hazards out to an hour within the corridor region. This product is more detailed than the national products (NCWF and Convective SIGMETS), but with a wider scope than an individual radar site (ITWS). Lincoln Laboratory has the responsibility for evaluation.
- The NWS and the FAA accepted the National Convective Weather Forecast (NCWF) for short-term forecasts of thunderstorms for operational use (4/2001). The product will be deployed on TMS for display at FAA operational centers by 10/01.
- The AWTT process led by ARS-100 has evaluated in-flight Icing Products. The Integrated Icing Diagnostic Algorithm (IIDA) will be considered for operational implementation (12/01).
- Model Development of the Rapid Update Cycle (RUC) model.

Mid--Term/Long-Term:

- The FAA Aviation Weather Research Program (AWRP) has the lead for improved weather products and forecasting capabilities. Development of early and more precise identification of hazardous weather, to flights in the en-route environment, will lead to improved strategic planning and tactical applications of route management.
    - The Aviation Weather Technology Transfer (AWTT) Board has reviewed new products (4/01; 12/01) and established a mechanism for encouraging the transfer of research products into operational application.
    - The National Research Council has been commissioned to review the prospects for extending the capability of forecasting convective thunderstorms, and a report will be available in 2002.

- Current AWRP product team research that applies to the en-route environment include:
  - Aviation Forecasts and Quality Assessment (AFOA)
    - Products: Aviation Digital Data Service (ADDS) is the primary Internet platform for AWRP products and has received widespread acceptance from the pilot community.
    - Real Time Verification System (RTVS) is the tools and database for the ongoing evaluation of new products; e.g., NCWF; CCFP: IIDA.
  - Terminal Icing
    - A research project (RIDS, Radar Icing Detection System) is underway that would remotely detect hazardous icing conditions aloft using a network of surface-based, polarized radars.
  - Model Development and Enhancement
    - The Rapid Update Cycle model is the basis for improved aviation forecasts, as well as for algorithms to detect hazardous flight conditions; e.g., IIFA icing forecasts. The high resolution RUC-20 version (20 Km horizontal resolution) in going through the final implementation stage and will go operational in 2/02
    - The Weather Research and Forecasting (WRF) model is under development with contributions from experts at more than 4 national centers and universities. This next-generation model will bring radical improvements in vertical and horizontal resolution, as well as improved forecasts of aviation variables. A workshop was held (8/01) to collaborate on model development that will build for operational deployment in FY05.
  - NEXRAD Enhancements
    - Products: Rapid Product Update will bring improvements to the output from the existing NEXRAD network. The Joint Polarization Experiment is a field test of polarization capabilities that will be conducted in 5/02.
    - Convective Growth and Decay.
    - Mesocyclone Detection.
  - Convective Weather
    - The Terminal Convective Weather Forecast (TCWF) is the basis for ITWS (terminal) and CIWS (enroute) products. These tools are being implemented in the Short Term.
    - The National Convective Weather Forecast (NCWF) also utilizes a version of TCWF technology and is now undergoing operational implementation in the Short-Term.

The Corridor Integrated Weather System (CWIS) will be the basis of a field study (THunderstorm Operations Research; THOR) that will include the participation of other

short-term convective weather forecasting methodologies; i.e., NCWF and a similar NWS forecasting product- 3/02. The incorporation of satellite data into convective forecasting algorithms will be addressed by 8/02.

- Turbulence
  - Products: Turbulence Forecasting Integrated Turbulence Forecast Algorithm (TCWF) continues as a research objective.
  - Turbulence Observation In-Situ Measurement and Reporting

- Integrated ground based and/or airborne sensor/system improvements applied to weather products and decision support systems (DSS). Candidate sensor and system applications include:
  - Operational and Supportability Improvement System (OASIS).
  - ASOS Controller Equipment – Information Display System (ACE-IDS).
  - Stand Alone Weather Sensor (SAWS).
  - Automated Weather Sensor System (AWSS).

Key Decisions

- Installation of sensors or radar facilities as appropriate, including environmental impact studies.
- Increase adoption of user Pilot Reports programs (e.g., Northwest and United Airlines turbulence information programs).

Key Risks

- Funding of AWRP programs.
- Community roadblocks to radar or sensor installations.
- Operational implementation and significance of the anticipated improvements in TFM as a result of improvements made to convective weather forecasts.
- Speed of the research and development of weather sciences.
- National Weather Service cost/benefit analysis for producing additional aviation weather products and systems.
- A satisfactory assessment by the three organizations responsible for weather product evaluation: the AWTT Board; the CDM-CR Committee; and Lincoln Laboratory, including follow-up for operational implementation.
- Cost/benefit analysis for outfitting aircraft with additional weather sensing equipment.

EW-1.2 Dissemination of Common Weather Information

Scope and Applicability

Near-Term:

There were several improvements in information dissemination:

- Improvements in the CCFP dissemination and access based on recommendations from Spring/Summer 2000 review from the broadest range of stakeholders. The focus on this effort is to ensure the CCFP is available on the ATCSCC web site and the Aviation Weather Center (AWC) web site. Furthermore, the CCFP will become available on the TMS at FAA centers after 10/01.
- The National Convective Weather Forecast (NCWF) will be distributed on the TMS after Fall 2002
- Runway Visual Range (RVR) information is currently being provided to users via the CDMNet for 42 airports.
- Identify policies, procedures, and issues that are barriers to exchange of weather information.

Mid- and Long-Term:

- Weather information use and dissemination that can be used to support strategic planning for TFM and built into TFM tools.
- An Operations Concept (Conops) for the operational use of weather information and forecasts needs to be written for the TMUs at the local, regional, and national level. This Conops would incorporate the use of new systems: WARP, ITWS, CIWS, and emerging weather tools: for weather hazards; e.g., CCFP, NCWF, IIDA. Subsequently, standards and procedures will follow.

Key Decisions

- Weather research funding.
- Infrastructure needed for the dissemination of weather products and for system access (e.g., web access policies and/or exploration of other means of general distribution of community use weather products).

Key Risks

- Speed of improvements in the state-of-the-art of weather science.

EW-1.3 More Precise Identification of Flights to be Impacted by Severe Weather

Scope and Applicability

Near-Term:

- Flow Constrained Area (FCA) tool was deployed (phase 1) on 6/18/01. (Ref: ER-2.1) Additional CRCT capability will be implemented in ETMS. FCA's provide identification of specific flights that will be affected by severe weather for more targeted resolutions.
- A committee is considering policies, procedures, and practices that identify and disseminate lists of affected flights using FCA capabilities. The committee will also reach resolution on actions to be taken.

- A tool to provide Traffic Management Specialist capabilities to assess the impact of proposed flow management strategies on NAS flows.
- DSP assigns a departure time to achieve a constant flow of traffic over a common point. Runway and departure procedures must be considered for accurate projections.

Mid-Term:

- Additional flight filtering and CRCT re-route functionality will be implemented in ETMS.
- Automation development for communication flight plan changes quickly.
- Information to produce solutions to airspace capacity and en route weather constraint problems.

Key Decisions

- Early intent filings (e.g., proposed four hours prior to departure) by the NAS users, to enhance ETMS data quality, for improved flight identification and predictability.
- Define collaborative processes and procedures for using FCA capabilities in ETMS.

Key Risks

- Speed of the research and development of weather sciences.

EW-1.4 Display Detailed Weather to Controllers

Scope and Applicability

Mid-Term:

- Development of policies and procedures prior to implementation of NEXRAD weather display on DSR. Policies and procedures have been reviewed for all labor-management issues, and agreement reached. MOUs signed by PASS (8/01), and NATCA (10/01)
- Full deployment of NEXRAD weather-on-controller-display (DSR) requirements (e.g., procedural changes) to ensure controller has accurate weather information from which to identify potential impact areas. The WARP communications and display is now implemented in all ARTCCs and the ATCSCC so that weather data is available to all TMUs and on the Briefing Terminals for TFM Specialists. All software formatting required for WARP-to-DSR terminals have been accomplished.
    - Operational test and evaluation at DFW by Jan 02
    - Repeat OT and E at JAX by Apr 02
    - National implementation in the second half of CY02.

- AWRP is developing actions and milestones to achieve the objective for the mid term to long-term: Rapid update of "point products" (hazards); new radar volume coverage to decrease the time of radar refresh rate. This work is ongoing.

Key Decisions

- Roles and responsibilities with respect to hazardous weather avoidance (NATCA, TWU, ADF, ALPA, APA, NBAA, RAA).

Key Risks

- Agreement on roles, responsibilities, and accountability issues.
- Deployment of required interfaces (e.g., WARP/DSR) is complex process and may induce schedule delays and additional requirements (e.g., security).